

November 27, 1849.

R. H. Solly, Esq., in the Chair.

The following papers were read :—

1. ON THE LORINE GENUS OF PARROTS, ECLECTUS, WITH THE DESCRIPTION OF A NEW SPECIES, ECLECTUS CORNELIA. BY CHARLES LUCIAN, PRINCE BONAPARTE, F.M.L., F.Z.S. ETC. ETC. ETC.

The richness, good scientific order and proper management of the well-kept Zoological Garden of Amsterdam, as well as the courtesy and liberality of its able director, Mr. Westerman, will strike every naturalist, even though coming, as I did myself, from England. The establishment has been lately illustrated by the pen of H. Schlegel, equally superior when it removes the boundaries of science for professed zoologists, or renders it useful and popular to ladies and children. With or without his valuable book, a visit to this attractive spot would be fully repaid by the inspection alone of the gigantic Salamander, *Sieboldia maxima*, Bonap., which has grown more than a foot in length since I gave it that generic name; not to speak of the beautiful collection of living *Fringillidæ* and *Parrots*. Among the rarest and most splendid species of these latter birds, collected from every quarter of the globe, I will only mention, from America, a magnificent *Macrocerus hyacinthinus*, Vieill., with the bill still larger than usual; from Africa, the Congo Jack, *Pionus gularis*, established a few weeks ago by Sir William Jardine; and from Malasia the *Lorine*, which I now introduce to the Zoological Society, sure of their receiving with forbearance my compendious account of its relations.

The genus *Eclectus* of Wagler holds a conspicuous place in the family of *Lorine Parrots*, and is eminently natural if kept within the proper boundaries assigned to it by its founder, including his two only species, and, as a third, my new one, all from the Moluccan islands, and similar in form, having a large stature, the plumage loose, red, with more or less blue, a powerful black bill with scarcely a cere, a smooth simple tongue, and a shortish square tail.

1. ECLECTUS PUNICEUS. *E. coccineus*, *dorso*, *alis*, *caudâque purpureo-fuscescentibus*; *marginè alarum*, *tectricibus inferioribus*, *remigibus*, *annulo ophthalmico*, *fasciâ abdominali et torquæ interscapulari*, *pulchrè cyaneis*; *crisso*, *et caudæ apice*, *rubris*.

Synonyms.

- Psittacus puniceus*, Gm. (exclus. specimin. rostro rubro.)
Lorius amboinensis? *Briss. Orn.* iv. p. 231. sp. 19.
Psittacus cardinalis? *Bodd. ex Lory d'Amboine, Buff. Pl. Enl.* 518.
Domicella! *punicea*? *Wagl. Mon. Psitt. in Act. Monac.* p. 569. gen. xiii. sp. 3.





Wolf del et lith.

colored by H. S. G. S. G.

ECLECTUS CORNELIA. Pr. Bonap.

Eclectus Linnæi, *Wagl. Mon. Ps.* p. 571. gen. xiv. sp. 1 ; *Gray, Gen. tab.* 103. f. 1.

Lorius cardinalis? *G. Gray, nec Hombr. et Jacq. Voy. Astrolabe et Zélee.*

Hab. New Guinea, where it has been killed often on the west coast near Lobo, by M. Sal. Muller.

The iris in this species is black.

Misled by Wagler, and judging by the plate of Buffon, which certainly gives the idea of a true *Lorius*, Mr. G. R. Gray has, by double employment, considered the *puniceus* as one of these birds in his 'Genera.' Should he have seen the Parrot, he would have perceived it to be identical with his *Eclectus Linnæi*, and consequently that *puniceus*, which Kuhl only went a little too far in confounding with *B. grandis*, far from being generically distinct, is, even as a species, very nearly allied to it.

2. *ECLECTUS GRANDIS.* *E. coccineus, dorso, alis, caudâque, purpureo-fuscescentibus; margine alarum, tectricibus inferioribus, remigibusque, apice cyaneis; abdomine, et torque interscapulari, subviolaceis; crisso, et caudæ apice, luteis.*

Synonyms.

Psittacus grandis, Gm. Lath. Kuhl (who unites the preceding with it).

Psittacus ceylonensis, Bodd. ex Lory de la Nouvelle Guinée, Buff. Pl. Enl. 683 ; *Brown, Ill. tab.* 6 ; *Levaillant, Perr. tab.* 126 adult, 127 junior, 128 juv.

Eclectus grandis, Wagl. Mon. Psitt. in Act. Monac. 1832, p. 573. gen. xiv. sp. 2.

Eclectus ceylonensis, G. Gray, Genera of Birds.

Hab. In Insulis Moluccis.

Often brought from Amboina, but the native place is not well ascertained. Doctor Forsten (too often confounded with Forster), one of the scientific victims of climate, sent it to Holland from the island of Gilolo.

The iris in this species is golden yellow.

3. *ECLECTUS CORNELIA.* *E. coccineus, dorso, alis, caudâque, purpureo-fuscescentibus; margine alarum remigibusque apice cyaneis; tectricibus inferioribus rubro cyaneoque variis; abdomine, crisso, et caudæ apice, rubris concoloribus.*

(Aves, Pl. X., reduced to half the natural size precisely.)

I have named this beautiful bird after H. Schlegel's virtuous and talented wife, whose quick eye detected the species before professed ornithologists themselves, who relied on their possessing it among the unnumbered treasures of the as yet uncatalogued Leyden Museum * ; and I dedicate it to that lady with additional pleasure, as a

* The superiority of the Leyden Museum over any other is unquestionable, not perhaps so much on account of its containing a greater number of species than those of London, Paris, Philadelphia and Berlin, but for the freshness and perfec-

small testimony of gratitude for the happy hours spent, and the useful information collected, under the hospitable roof of the zoologist,

tion of the specimens, for the quantity of skeletons, and above all for the never-sufficiently-praised series of individuals of the various species of both sexes, in different ages, and from different localities and countries, which facilitate one's judgement, and show at once in most cases, especially with *Mammalia*, what is or is not a good species. For this and many other reasons, a detailed Catalogue of this splendid collection is a necessity of our days. We can hardly conceive how the many treasures accumulated in that National establishment by the indefatigable zeal of its so well-known director, Temminck, seconded by M. Schlegel and their subordinates (whose industry may be appreciated in England by those acquainted with M. Frank the Amsterdam merchant, so useful to science and naturalists of every country), are still allowed to remain unknown and undescribed; the Museum itself, with its numerous new species, being left *uncatalogued*, and that in the year 1850! The discoveries made by Dutchmen in far-distant lands, to the peril of their lives, and with their own or their government's capital, are thus daily exposed to be anticipated by other nations, and monopolized by the ever-increasing struggles of English industry; whilst a scientific Catalogue published on the plan long since advocated by Professor Is. Geoffroy St. Hilaire for the museum of the great French Nation, that is, with descriptions and figures of all new or not sufficiently-known species, would be an imperishable monument for science and for the Dutch Nation. And the greater benefit have we the right to expect for science from the execution of this noble enterprise, inasmuch as M. Schlegel, who would certainly be the head and arm of the publication, combines the knowledge for which he has long been celebrated all over the world, with the skill of a first-rate draftsman. His paper on Iconography applied to Natural History (Mem. Taylerian Soc. Haarlem), in which beautiful drawings of his own are produced as examples, after he has critically reviewed the standard works of every nation, and while giving sound precepts to artists devoted to our science, ought to be known everywhere, and at least translated into the English language. Under such circumstances, no book on Natural History, we shall never enough repeat it, would prove more effectual to the progress of science, more creditable to the nation, to the government, and to the able individuals willing to accomplish the labour, than the Catalogue of the Leyden Museum on the enlightened plan above-mentioned, which such a naturalist as Schlegel certainly could not fail to improve in the course of elaboration.

In order to prove our assertion, it is enough to remark, how much by the desired publication would be improved our knowledge of the Malasian fauna, since, of the productions of the island of Gilolo alone, all those collected at the mere landing of the Dutch naturalists, upon a surface of a square mile, proved to be new, and many of them very important additions to science; to indicate the number of undescribed objects received from Ashantee; and to point out the advantages arising from the facility of placing henceforth beyond the possibility of doubt the existence of remarkable species unaccountably rejected or misplaced, as *Gavialis Schlegeli* and *Testudo emys*. But to justify fully our insisting on these facts, I will select a few animals which I shall have perhaps the honour thus first to introduce to the English naturalist, and these examples I shall take out of each of the different classes, saying of the animals just as much as is necessary to excite, not to satisfy scientific curiosity. Among the new *Mammalia*, some of which will constitute new genera, I shall choose a third living species of Elephant.

ELEPHAS SUMATRANUS, Temm., based upon four skeletons which I admired in company with my learned friend and colleague, Prof. Is. Geoffroy St. Hilaire of Paris. This species is perfectly intermediate between the Indian and African, especially in the shape of the skull, and will certainly put an end to the distinction between *Elephas* and *Loxodon* with those who admit that anatomical genus; since although the crowns of the teeth of *E. sumatranus* are more like the Asiatic animal, still the less numerous undulated ribbons of enamel are nearly quite as wide as those forming the losanges of the African. The number of pairs of false ribs (which alone vary, the true ones being always 6) is 14, one less than in the *africanus*, one more than in the *indicus*; and so it is with the dorsal vertebræ,

who possesses the deepest knowledge of each and every class of vertebrate animals, and whose literary and *truly philosophical* attainments are only equaled by his practical and thorough acquaintance with species, the only solid base of our science.

Hab. In Insulis Moluccis; most probably from Ceram.

The total length of this Parrot is 1 English foot 2 inches, the wings measuring $8\frac{3}{4}$ inches, and its tail $5\frac{1}{2}$ inches. The bill is black, as in the other Noble-Lories (*Eclecti*), and the small portion of the cere that remains uncovered by the red feathers of the front is greyish; the red colour on the head is brighter than on the rest of the plumage, and somewhat lighter than in the other species; the naked ring around the eye is very narrow and grey, without the small blue feathers that surround it in *Eclectus puniceus* only; the iris is stramineous and exteriorly of a reddish colour; the pupil, excessively dilatable, is blue-black. The feet are grey, with the granular little scales blackish; the nails black. The quills are greenish internally, reddish externally, but with their point of a shining blue; on the under surface they are entirely blackish; the under wing-coverts are red, intermixed with blue. The tail-feathers are of a dull red, with black shafts, and internally somewhat greenish. The bottom of the whole plumage is lead-colour.

The absence of blue on the back and abdomen at once distinguishes our new Parrot from both its congeneric species, the red colour prevailing so much on its plumage that even the under wing-coverts are variegated with that colour, and not pure blue as in the others. Our

which are 20 (21 and 19 in the others), whilst the new species agrees with *africanus* in the number of sacral vertebræ (4), and with *indicus* in that of the caudal ones (34).

Of the Birds I shall only mention *Agelastes meleagrides*, Temm., a lesser Talegalla, furnished with a strong spur, very rounded wings, and a flat tail. The head and neck are naked; a very broad white collar; all the rest of the plumage black, finely undulated with white.

In the Reptiles a new *Viperine* may be spoken of with great interest, constituting certainly an independent genus (*Chloroechis*, Schlegel), and showing that Nature takes pleasure in hiding under the similarity of tints the snares of a detestable animal, as the innocence of the females of showy birds affords them protection against the tyrants of the air. The green colour of this poisonous Serpent from Ashantee, as well as its forms, recall the *Dendrophidinae*, and make it, though a true *Viperine*, lead an arboreal life, and conceal its perfidious power among the foliage of the trees.

From the Amphibians a dozen of undescribed *Hyladinae* will prove Africa not so deficient of these elegant Frogs as it has been supposed to be; whilst another small *Batrachian* from New Holland (*Myiobatrachus paradoxus*, Schlegel) has the general appearance of a *Bombinator*, but with the body rounded and the legs and toes shortish, somewhat connected or at least entangled by the marginal skin of the flanks. It is rendered remarkable in the whole class of Amphibia by two long curved canine teeth situated towards the end of the superior jaw, and much resembling fangs.

Among the Fishes I have particularly admired a *Percine* from the Cape, allied to the *Anthias buphthalmos* of my 'Fauna Italica,' and called by Schlegel *Anthias gibbiceps*. . . . But what, if hundreds of new species of that class (and I am still dazzled by the sight of many and many even of my favourite *Pleuronectidæ*) would by their being well known greatly benefit our science, and alone give convincing proof of the propriety, nay, I may add, of the urgent necessity, of the publication?

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Ecl. Cornelia stands therefore with *puniceus* and *grandis* precisely in the same relation that *Lorius unicolor*, Bechst. (Levaill. pl. 125) does to *Lorius tricolor*, Steph. (*Ps. lory*, L., figured in Levaillant's plates 123 and 124), both being almost entirely red, and wanting the blue tinges on the so-called scapular. From that analogous variety of a red-billed species, however, the black bill will tell it at once, even to those superficial observers who only look to colours; and as to another *cardinalis* (besides the *puniceus*, so called by Gray, through reverence to the heterodox Boddaert), that of the Astrolabe and Zé-lée's voyage, the generic difference is still more strongly declared in that species of French naturalists, since it has a greater nudity round the eye, a wedge-shaped tail, and more slender and elegant forms.

This is not the place to enter into a discussion about geographical species, local races, or varieties. Our *Electus Cornelia*, notwithstanding its identity of forms and similarity of colours with *E. puniceus* and *grandis*, which might induce a philosophical mind to consider the three as forming but one and the same species, differs more from either of the two than they do from each other, although they have been placed in different genera. It is impossible at all events that the three should not be kept distinct by those naturalists who wish to represent Nature as it is, not as they would have it; and consistency forbids to consider them otherwise than species as long as we admit as such the *Lagopus scoticus*, and the different kinds of Sparrows of Europe; and they certainly deserve that title more than the inconstant geographical modifications of *Falco peregrinus*, admitted as species by those who slight over the much more important and at least constant differences of the Vulturines. *Habent sua sidera . . . species!* That is all we have to say on so important a subject for the present.

It is impossible to imagine a bird of milder and more gentle disposition than our *Electus*. The specimen figured allowed itself not only to be handled in every manner, but placed free, out of its cage, would allow every measurement to be taken, its wings pulled, its tail spread, and every feather to be counted and described. Even when its patience was at an end, and it resorted to its bill, it was gently; and it would only use the powerful weapon in seizing the intruding finger without inflicting any kind of injury. It uttered a low note, resembling that of the coot (*Fulica atra*, L.) when heard at a distance.

2. DESCRIPTION OF A NEW SPECIES OF GORGONIA FROM AUSTRALIA. BY J. E. GRAY, ESQ., F.R.S.

PRIMNOA AUSTRALASIE. (Radiata, Pl. II. f. 8, 9, nat. size.)

Coral elongate, unbranched, rather tapering; cells numerous, regular, placed in close regular circles round the stem, each formed of two series of imbricate calcareous scales.

Inhab. Australasian seas, on oyster-shell and stones.

Several specimens of this very interesting coral were sent to the British Museum by the Royal Society of Van Diemen's Land.

This coral is often covered with various species of smaller *Coral-*

lines and *Algæ*. It varies from two to three feet in height. The axis is known from the unbranched species of *Gorgonia* by being more calcareous, and of a pale greyish colour.

Joseph Millingin, Esq., F.L.S., the Secretary of the Royal Society of Van Diemen's Land, has kindly sent me the following particulars of this coral:—

“It was fished up from a depth of some fathoms in D'Entrecasteaux Channel, between the mainland of Tasmania and Bruce's Island. It is found, as you will see, affixed to rocks and stones, and to dead, broken and half-decayed oyster and scallop-shells, &c. It usually exists in groups, groves or families, varying from three to four to a great many. The long delicate stem, which is horny-looking and highly elastic when dry, varies from the thickness of a knitting-wire to that of a crow-quill, and from its mineralized and root-like attachment, tapers gradually and gracefully to the beautiful acicular point, attaining not unfrequently a length of two or three feet, and having its entire surface covered with a calcareous coat of a cream-yellow colour, delicately annulated, so as much to resemble the fine string of wooden beads worn as a necklace by the poorer natives of Bengal, but with this difference,—that in the coralline the beads form a connected or rather continuous chain, independently of the delicate elastic centre upon which the mineral structure is deposited. I am informed that in one or two instances, when these corallines were procured, they were enveloped throughout with a mucilaginous or jelly-like substance, which when they become dry is exsiccated and shriveled to such a degree as to be scarcely if at all traceable. You will be able to say whether you consider it likely that there exists, in the recent and living state of the zoophyte, such an external and soft organization.”

This jelly-like substance was doubtless the polypes.

3. ON THE EVIDENCES OF AFFINITY AFFORDED BY THE SKULL IN THE UNGULATE MAMMALIA. BY H. N. TURNER, JUN.

I had occasion in the introductory part of my communication on the arrangement of the Carnivora, to make allusion to certain details of structure in the crania of the Pachydermatous and Ruminant Mammalia; and I there pointed out a few peculiarities, which clearly distinguished the Perissodactyla of Professor Owen, both from the Ruminant and Non-ruminant Artiodactyla, and also the two latter divisions from each other. It is to our eminent Comparative Anatomist that we are indebted, by the discovery of some new characters, and the correction of certain former errors of observation, for the establishment of that mode of subdividing the Ungulata which first suggested itself to Cuvier; but there can be no doubt, that when the entire anatomy of the order is investigated with this view, many constant distinctions will yet be made apparent, and our appreciation of the comparative degrees of affinity among its members will become clearer as we proceed.

In taking up the subject as it has thus been left, I have first directed my attention to the skull, as being that part in which the

greatest number of characters are presented at one view, and for the study of which I have had the most ready opportunities ; and I now propose to offer such results of my observations as I have been able sufficiently to mature. In pointing out the characters of the skull which distinguish these two grand divisions of the Ungulata, the differences will appear more striking if I consider the Perissodactyla as they are restricted by Prof. Owen, namely exclusive of the Proboscidian and other aberrant forms, which, though they agree with them in the most essential characters, differ in many points of conformation.

The nasal bones in the Perissodactyla are gradually widened behind, so that their posterior angles approach the anterior margins of the orbits, between which the suture which separates them from the frontals runs more or less directly across the skull ; we may naturally expect such a character to be masked by the singular modification which these bones undergo in the Tapir ; but in the Artiodactyle division, even though the extreme points of the nasal bones occasionally extend very high, or as in the Llama, and in the genus *Cephalophorus* among the Antelopes, a sudden extension from their outer edge descends a little on each side of the face, this decided character is never manifested.

The intermaxillary bones in the Perissodactyla, if there be teeth developed in their median portion to a functional size, are always deep enough to allow them to be vertically implanted, while in the Artiodactyla, the teeth when existing in this bone always incline towards each other, their roots being divaricated to allow the nasal opening to extend down between them. In this group, with the singular exception of the genus *Hippopotamus*, we find a distinct foramen above the orbit for the passage of the supraorbital nerve, with a groove extending from it down the face ; while in the Perissodactyla, it would appear as though this nerve would issue at a point more towards the outside, since the foramen only exists in the Horse, in which it is placed quite at the commencement of the postorbital process, and has no groove continued from it.

In the interior of the orbit, there is always, in the Artiodactyla, an increased concavity of surface upon the anterior side about the junction of the lacrymal and frontal bones ; and in the middle of this fossa, upon the edge of the lacrymal somewhere between the ductus ad nasum and the entrance of the infraorbital canal, a pit, most strongly marked in the Hogs, which serves, as I have found in the Sheep, for the origin of the obliquus inferior muscle of the eye, the remainder of the fossa being filled up with adipose matter. In the Perissodactyla no such fossa exists, and there is never more than a very slight depression marking the origin of the muscle, in most cases not perceptible at all. The shortening of the bony palate in the latter group, the small difference of level between it and the base of the cranium, together with the longitudinal extension of the posterior nasal orifice, the lateral spreading-out of its walls and the constant existence of the alisphenoid canal, which I pointed out in my former communication, may be again adverted to.



W. J. Fish From a sketch made at Cairo, Dec 1841

YOUNG HIPPOPOTAMUS
Presented to the Zoological Society by H H Abbas Pasha

Printed by H. J. Fisher, & W. J. Fisher



The pterygoid ridge in this group is not very strongly marked, and gradually dies away upon the lamina enclosing the alisphenoid canal; the pterygoid processes have considerable antero-posterior extent, and the true pterygoid bones are reduced to mere ribands. On the other hand, in the Artiodactyla, the pterygoid ridge, continued from the inferior root of the zygoma, terminates abruptly, with a free process in the Ruminants; while in the Hogs and other allied forms, it is from this process that a laterally projecting plate extends down on the outer side of the pterygoid process, forming a pterygoid fossa in a manner different from all other mammalia, and very characteristic of these Non-ruminant Artiodactyles. The temporal bone in the Perissodactyla also furnishes characters in the back of the zygoma, which gently slopes away to its origin, and in the association of a distinctly marked eminentia articularis with a rather large and more or less thickened and mammilliform post-articular process. The principal differences in the occipital bone I pointed out in my former paper, and notwithstanding the marked difference between the Hog and the Ruminant, I must observe that they agree in the flatness and squareness of the basal portion, while in the Perissodactyla it is transversely convex, being rounded off on each side into the great foramen lacerum.

I mentioned in a note appended to my former communication, an idea which occurred to me just before that paper went to press, that a further distinction between the two groups might be found in the structure of the premolar teeth. I have found, on investigation, that the character will not always admit of being rigidly applied, since in some genera of Perissodactyla, as the *Lophiodon* to which I there alluded, the posterior lobes of the premolars are not so completely developed as they are in the true molars; and on the other hand, in some of the Artiodactyla, as the Peccary, they advance a little beyond the rudimentary condition in which they are usually found, though never attaining an equal development with the others. The character will however in most cases enable us to distinguish; and in the course of the observations I was thus led to make, I have discovered another more important one, which I will next proceed to explain.

If we consider as an entire molar tooth that which has four principal tubercles, the molars of the lower jaw must be said to be placed each in advance of its homologue in the upper jaw to the extent of a quarter of a tooth, so that the premolars, which in most cases represent but half molars, alternate with their opposing teeth above. It is in accordance with this universal law, that the last lower milk molar in the Artiodactyle division of the Ungulata has three pair of lobes; not, as has been imagined, that it may pretypify the last true molar, which in the same group is usually also six-lobed. The last lower true molar, being placed like the rest, a quarter of a tooth in advance of its four-lobed opponent, the pair of tubercles that are added to it behind play against the posterior surface of the hindmost pair of lobes of the upper tooth; but in the last lower milk molar it is the anterior pair of cusps that are supernumerary, since they close between the two pair of principal tubercles of the penultimate upper milk tooth, which like the last one has the form of a true molar; while

the penultimate lower milk molar, which in this as in most groups represents but the half of a true molar, furnishes opposition to its most anterior surface. Although it is not always literally true, that in the Artiodactyla the premolars represent each but the half of a true molar, and in the Perissodactyla an entire one, it is certain that in the exceptional cases among the former group, the parts representing the posterior division of the tooth are small, or merely rudimental; and that in the latter group, it is only in the most anterior of the series that the posterior portion of the tooth is ever altogether wanting. It is also certain, that all those genera of which the milk dentition has been seen, conform in that particular to the general character, the distinction being well-marked in the Artiodactyla between the *two last* upper milk teeth, whose characters are those of true molars, and those which precede them and represent but half ones, the same difference also prevailing between the *last* and those which precede it in the lower jaw; always necessitating the existence of a third pair of tubercles in the last lower milk molar to work in the interval of the two pairs in the penultimate above; while in the Perissodactyla, the constant existence of a well-developed posterior pair of lobes in the penultimate lower milk tooth abrogates the necessity of a third pair in the last one, and consequently we need not expect to find it, even in those genera, such as *Lophiodon* and *Palæotherium*, of which the additional lobe to the last true molar is characteristic. Of the first-named genus, the milk dentition, so far as I am at present aware, is as yet unknown; but among the plates in the 'Ossemens Fossiles' examples may be seen of the lower jaws of young Palæotheria, exhibiting the milk teeth, of which the last has but two lobes*. Therefore the tripartite condition of this tooth becomes a constant and important character of the Artiodactyle division.

Most of the characters which separate the Ruminant and Non-ruminant divisions of the Artiodactyla have been pointed out in my former paper, as well as those which distinguish the two subdivisions of the Hog-tribe, which by the analogy of the amount of difference in those of other groups, I think must be looked upon as families,—*Suidæ* and *Hippopotamidæ*. The striking character derived from the sudden termination of the pterygoid ridge in the Ruminant, and the formation of the pterygoid fossa in the other division, has been alluded to above†. The considerable upward extension of the masseteric ridge upon the os malæ beneath the orbit seems also characteristic of the Ruminants, as well as the bifurcation of the orbital ala of the sphenoid,

* Pl. 4. fig. 1 (alluded to by Professor Owen), and pl. 56. fig. 2.

† In the Hippopotamus the pterygoid ridge runs inwards and even a little backwards, and then forms a slight angle at the point of junction with the pterygoid process, which then runs downwards and forwards, so that the outer wall of the fossa exists as in the allied forms, while, as I have before observed, it is the inner one which is wanting. I must again refer to the remarkable osseous bulla within the orbit of this animal, since I find that the same thing exists, though of much smaller size, in most ruminants; in many skulls it is broken away, and when remaining it so lies upon the "tuberosity" or posterior termination of the alveolar process of the maxillary bone as to appear at first like a part of it. It opens into the nose and antrum maxillare, and has no connection with the lacrymal apparatus.

which sends a branch forwards for a considerable distance, often so far as to articulate with the lacrymal bone. They also differ from the Hog-tribe in having, like the *Perissodactyla*, a distinct styloid process, emanating from the mastoid bone, partly enclosed by a portion of the tympanic, and with a truncated extremity, to which one of the angles terminating the "lesser cornu" or stylo-hyal bone is attached; while in the Hog-tribe this process is so completely pressed between the paroccipital process and the auditory bulla, that in most cases it does not seem to exist.

It will perhaps be most convenient to assign the rank of "family" to the four generally received subdivisions of this ancient order, although the osteological differences which they present are very slight; such few as I could find in the skull I will now point out. In the Camels and Llamas, the articulation of the lower jaw differs from that of Ruminants in general, in having a distinct *eminentia articularis*, separated by a fossa not having the character of an articulating surface from the post-articular process, upon which is another facet; the condyle of the jaw having likewise two articulating surfaces placed at right angles with each other. There is also a marked peculiarity in the auditory bulla, since the outer wall of the vaginal process forms a deep, thickened, vertical plate, burying the styloid process between it and the opposite part of the bulla. On looking at the casts of the skull of the *Anoplotherium* existing in our museums, I perceive, immediately under the meatus auditorius, a strong vertical process, apparently the outer edge of this lamelliform expansion, the remainder being concealed in the matrix. I fully concur in Professor Owen's reasons for considering the *Anoplotherium* as a ruminant, and this indication of character, in addition to the many resemblances which authors have pointed out, renders it probable that this early representative of the *Artiodactyla* belonged to the family *Camelidæ*. The existing members of this family also most approach the *Anoplotherium* in the form of the ascending ramus of the lower jaw, and the strongly-marked notch which bounds the angular process above.

I am glad to find that I have the sanction of Professor Owen's opinion in referring the *Merycopotamus* to the ruminant division, since on examining the specimens in our National Museum, I find that in addition to the form of the teeth, which if taken alone are not always to be depended on, all the essential characters of the skull are in accordance with that type. The masseteric ridge reaches to within half an inch of the orbit, and above the zygoma is a distinct indication of the foramen usually existing there in Ruminants. The glenoid surface is slightly convex anteriorly, and terminated behind by a distinct post-articular process, on to which the articulating surface is continued without intermission, thus indicating the animal to be ruminant, but removing it from the *Camelidæ*. The pterygoid ridge terminates in an angle, which, however, is not prolonged into a process; from this angle there is *no* transverse lamina extending down to join the pterygoid process, and consequently no pterygoid fossa. The articulating surfaces of the occipital condyles seem to extend on to the processes anterior to them; the auditory bulla is rounded, but

as the state of the specimens will not permit any definite character to be drawn from it, I will not venture an opinion as to which family of Ruminants should claim this remarkable form.

Among the remaining families, I have noticed that in the *Moschidæ* and *Cervidæ* the styloid process becomes free almost immediately at the base of the auditory process, while in the *Bovidæ* or Cavicorn Ruminants, it is enclosed more or less completely for some distance in the downward and forward direction. The *Cervidæ* may also be distinguished from the latter by the form of the infraorbital depression, which has its most sudden sinkage on the upper side, or that which is next the infraorbital fissure. The Giraffe, although it has neither the depression nor the fissure, resembles the *Cervidæ* in the character of the auditory bulla, and in having the molar teeth expanded at the base of the crown, and compressed towards the summits of the lobes. The *Moschidæ* must, of course, be distinguished from the *Cervidæ* by their trilocular stomach, and by the presence of the gall-bladder*, and it is probable that further differences in their internal anatomy may yet be found; I must however revert to the subject of dentition to point out some characters in which they differ from all other Ruminants, and agree with the non-ruminant Artiodactyla. In these, as well as in some of the Musk-deer, the premolars, and those that represent them among the milk series, assume a trenchant form, and have a more or less developed additional cusp both before and behind; this little cusp also shows itself upon the anterior extremity of the penultimate upper milk tooth, which, as well as the last one, has the bipartite form of a true molar, and therefore by this combination of characters may be recognised if found alone. In most Ruminants the cusp is very small, and when worn down shows itself merely as a thickening of the anterior border of the crown. This tooth, however, also presents us occasionally with a zoological character in the development or non-development of the internal tubercle of the anterior pair; it is absent in the Hog; in the Peccary (who seems loath to relinquish any of the full number of cusps that nature can allow him) it is present; the *Moschidæ* are the only true Ruminants in which I have found it wanting; this seems to characterize the family, and together with the trenchant character of the premolars in the *Meminna* and *Hyeomoschus*, seems to associate with them the genera *Dichobune*, *Dichodon*, and *Cainotherium*†.

* The singular variety in this respect noticed by Prof. Owen in the Giraffe, must detract somewhat from the value of the character; but as the absence of the gall-bladder seems to be the rule in this animal, it strengthens, so far as it can avail, the idea of Cervine affinity.

† In the true *Moschus* the premolars have much the same form as in the generality of Ruminants; the incisors are uniform and nearly equal in size, and the auditory bulla is small: in the *Meminna*, and in those to which the generic name *Tragululus* has been applied (which I can see no reason for separating from it), the last upper premolar alone is bicuspid, the other two and all the lower ones being trenchant; the two median incisors are expanded, the others narrowed and curved outwards to make room for them, and the auditory bulla swollen: *Hyeomoschus* only differs from these in the penultimate upper premolar, which though trenchant is short, and when worn down has the appearance of being simply conical.

This characteristic form of the penultimate upper milk tooth, namely the want of the inner crescent of the anterior pair, with the presence of the additional cusp in front, plainly marks as this tooth, that which Prof. Owen has indicated as the penultimate premolar in his recently discovered genus *Hyopotamus*, and as the *last* premolar in his also newly-described genus *Dichodon*; the tooth behind it in each case being the last milk tooth, which always agrees exactly with the true molars, but is distinguishable from them by its suddenly diminished size. The series of upper molars of the latter animal have been placed, in the published figure, to the extent of one tooth too far back; were they brought forward to their true position, the tripartite tooth below, which, according to all laws of form and succession, can be no other than the last milk molar, (of which the successor has not begun to appear,) would antagonize by its anterior pair of crescents with the space in front of the posterior pair in the penultimate milk tooth above. Of the *Hyopotamus Vectianus*, the figure represents a series of the crowns of five upper molars, of which the first is, as I have before observed, manifestly a penultimate milk tooth. These being represented without any appended portion of jaw, and no mention being made in the text as to whether they were found connected, it seems rather probable that such was not the case, and in the side view roots are added in outline to certain of the teeth and not to others, which makes that matter still more doubtful. At all events, this condition of things could not possibly have co-existed with that represented in the lower jaw attributed to the same species; since in the upper series of teeth we may count ten principal transverse eminences, while in the lower series of five molars, which ought to fit them, there are only eight depressions: besides which, it is impossible that the elevated summits presented by the trenchant lower premolars, with the correspondingly deep notch which their interval affords, could ever fit the comparatively diminutive elevations and depressions presented by the foremost teeth above. The lower true molars, however, show a much more worn condition than the upper ones; but even if it should be possible that the series of upper molars represented were in place and in use at the same time, it is evident that the foremost of them cannot be premolars*.

* I do not claim to be the sole discoverer of these incongruities (apparently the results of a too hasty determination), since I am aware that the true nature of the tripartite inferior tooth in the *Dichodon* has been perceived by some eminent comparative anatomists and naturalists; but I am here compelled to attempt their refutation, since, were Prof. Owen's determinations in these instances correct, insuperable objections would be presented to my generalizations on the character of the premolars as distinguishing the two groups of Ungulate Mammalia, and on that of the penultimate upper milk tooth as indicative both of its position in the series, and of the affinities of certain genera.

That the character of the penultimate upper milk tooth was appreciated by Cuvier, will appear from a passage in the 'Ossements Fossiles,' although it is rather vaguely and not quite correctly described. In speaking of a fragment of the upper jaw of a deer from the breccia at Nice, he observes: "On reconnaît aisément la seconde de lait pour ce qu'elle est, à sa forme allongée, à ses trois paires de croissans, et à son appendice transverse placé avant les croissans."—*Deux* "paires de croissans" would have been more correct. The possibility of an error in relation

Having now summed up as much of my series of observations with regard to the Artiodactyle division as I think it at present expedient to offer, I proceed to consider the Perissodactyle group. I observe that Prof. Owen separates the Proboscidea as a third group, to which he seems to assign a rank equivalent to that of the other two, and passes the *Deinotherium* and the *Toxodon*, as well as the "Sirenoid" forms, with some remarks which do not assign to them any very definite location. There will always be room for difference of opinion as to the rank that should be assigned to a group, even when its limits are fully recognised; since, as I have elsewhere endeavoured to show*, "granting affinities and even groups to be natural, the limits assigned to those degrees of difference and similarity which we are wont to indicate by definite terms are not;" but it seems to me, that although these more aberrant groups of Ungulata possess several peculiarities which are entirely their own, they do not differ from the Perissodactyla in essential characters to the same degree as the latter do from the Artiodactyla, while in certain respects they agree among themselves, as though they would constitute a second subdivision of the Perissodactyla again divisible into strongly marked families. Among the characters which I have brought forward, we find that the Proboscidea, the Sirenia, and the singular fossil genus *Toxodon*, agree with the more typical Perissodactyla in the depth of the intermaxillary bone and the vertical implantation of the incisors, in the absence of the supraorbital foramen, of the fossa and pit within the orbit, and of a strongly marked pterygoid ridge, in the character of the zygoma, except that in the Proboscidea there is no descending post-articular process; in the narrowing anteriorly, and rounded sides of the basioccipital bone, and in the resemblance between the anterior and posterior molares. They differ from the typical Perissodactyla and agree among themselves, in the upward direction of the nasal opening, the large size of the infraorbital foramen, the lengthening of the bony palate, with the comparative narrowing of the posterior nares, in the short antero-posterior extent and the transverse thickening of the pterygoid processes, and in the considerable angle formed between the basioccipital and basisphenoid bones (least marked in the Manatee), the latter being inclined upwards, of course with reference to the upward direction of the nasal canal. Points of resem-

to the upper molars of the *Dichodon* seems to have crossed the mind of Prof. De Blainville, for in a recent number of the 'Ostéographie,' after describing the dentition of the lower jaw in that animal, he proceeds: "D'après ce qui vient d'être dit du système dentaire de cette mandibule, on voit qu'il est incomplet par l'absence de la dernière molaire non encore sortie; mais ne doit-il pas en être de même pour la série d'en haut, si les deux pièces proviennent du même individu? Alors il faudrait admettre qu'au lieu de deux, il ne manquerait qu'une seule avant-molaire, ce qui paraît peu probable."

With regard to the *Hypopotamus Vectianus*, M. De Blainville seems to doubt a little that the upper and lower jaw really belong to each other, but refrains from a decided judgement, not yet being acquainted, as he observes, with any principle that can direct the mind in the question of the relation of two parts of the dental system to each other. He inadvertently calls this species "*annectens*," the name given by Prof. Owen to his *Paloptotherium*.

* Essay on Classification, 'Zoologist' for December 1847.

blance and of difference no doubt may be traced through the entire structure ; as, for instance, the femur of the Proboscidea, although it wants the third trochanter, so characteristic of the more typical Perissodactyla, resembles the corresponding bone in that group in the characters of the posterior side of its upper part.

If it be admitted that this assemblage of singularly modified forms have sufficient resemblance to form a group which shall, with the more typical Perissodactyla, constitute two divisions, about equal in rank to the two divisions of the Artiodactyla, there cannot be much difference in opinion as to the manner in which this group should be subdivided into families. The Proboscidea stand forth as one (*Elephantidæ*), and the Sirenia as another (*Manatidæ*) ; while the *Toxodon*, which in its most essential characters seems to agree with both, and in some points with each, has so many peculiarities of its own, that it appears entitled to rank as a distinct family of itself, which should be placed between the other two, not as a "connecting link," which its marked differences from either must forbid, and which if it were, it would but annihilate the distinction that exists.

It seems time that naturalists should have decided what it is that constitutes an affinity ; whether a form can really be allied to several widely-different groups. We may naturally expect to find, that amidst the varied forms each part assumes, a character which is the rule among the members of one group may be the exception in another, without of necessity supposing that a species presenting such a character can truly belong to both, and thus tend to destroy the difference of the original models on which the two groups are organized. In the present case, notwithstanding the peculiarities of structure mentioned as connecting the *Toxodon* with the Rodentia, its renowned describer, even while strengthening the idea of that affinity by adverting to Cuvier's assertion that the Elephants approach the same order, yet places it, apparently without a doubt, among the Ungulata, to which it obviously belongs. Although Cuvier affirms, that if all the parts of the head of the Elephant be compared successively with those of other animals, it is almost always among the Rodentia that their analogies will be found, he alludes only to three parts as indicating any such affinity. The relative size of the incisors and their alveoli can signify but little when their widely different structure is considered ; and he correctly tells us why the infraorbital foramen is large in both : the character of the os malæ is common to the Bats and Insectivora as well as the Rodentia, and seems to be a frequent concomitant of a degree of organization comparatively low. The direction of the incisors in the *Toxodon* differs very little from that which we find in many of the typical Perissodactyla, and the absence of roots is simply a physiological adaptation, and an indubitable proof that the detrition to which they were subjected was considerable ; while on the other hand, the whole structure of the cranium is on the ungulate type, especially different from the Capybara and the forms allied to it, whose skulls present so many striking characters, that if any resemblance really did exist, an anatomist to whom they were familiar would certainly perceive it at a glance.

It is a matter of considerable regret to me, that before concluding my notice of the *Perissodactyla*, I am again compelled to differ from that high authority to whom we owe so much, and in whose footsteps I may here be said, as it were, to follow. Although I am prepared to show that the evidence of the teeth, on which Prof. Owen decided the place of his genus *Hyracotherium*, is not so strong as it may appear; yet, on the other hand, their resemblance to those of the group to which I must transfer it is not so striking as to have caused me in the least to doubt the correctness of the place assigned to it, until I was well satisfied of the value of the cranial characters which I have pointed out. Although the true molars resemble those of the *Chæropotamus* and other non-ruminant *Artiodactyla* in the tubercular form of the four principal eminences, and in having the ridge surrounding the base more complete than is usual in the *Perissodactyla*, yet to make the resemblance good, they should have, in addition to the two smaller tubercles, the one in the front, the other in the middle of the tooth, a third one behind; and the fact is well worthy of attention, that each of these secondary tubercles is placed upon the angle of a bent ridge which connects the pair of larger ones immediately behind it, and which in the smaller species (*Hyracotherium Cuniculus*) exists, while the little tubercle itself is wanting; thus showing that the ridge is a more essential part of the tooth than the tubercle developed upon it; and this ridge just marks out in a rudimentary way the bent transverse ridges in the *Rhinoceros*, *Tapir*, *Palæotherium*, and other allied genera. The two last premolars differ from the true molars only in the non-development of the inner tubercle of the posterior pair, but of which a slight rudiment is still traceable; and the sudden change of form between these teeth and the two first is met with in no other genus, either of the *Artiodactyle* or *Perissodactyle* group. This would be perfectly in accordance with law, if the third and fourth molars belonged to the milk series, and the animal were *Artiodactyle*; but the whole series has the appearance of adult completeness, and neither the form nor the degree of wear of these teeth at all indicates such to be their nature;—indeed Prof. Owen himself never once hints at such an idea. To whichever group, then, this little animal be referred, the teeth will present marked exceptional characters, and therefore it becomes more necessary to seek for further evidence. I was first led to suspect a *Perissodactyle* affinity, through observing, by the figures and description published in Prof. Owen's very useful work on the British Fossil Mammalia, that the nasal bones exhibit the character of this group in a very decided manner, and that the supraorbital foramen and groove are entirely wanting. This induced me to examine with care the unique specimen in the Museum of the College of Surgeons, and I thus confirmed these characters, and also found that the mark indicating the origin of the obliquus inferior oculi is but a slight depression, not more marked than I have seen it in some skulls of *Rhinoceros* and *Hyrax*, and not placed in a fossa, but simply upon the general uniform concavity. Although the posterior portion of the skull is entirely lost, yet enough remains to show that there was but a slight

difference of level between the base of the cranium and the palate ; and to the inner side of the posterior molars there is just sufficient of the matrix removed to show a slightly raised curved line whose place is about that which the edge of the posterior nasal opening should occupy, if the animal be organized upon the true Perissodactyle type. A further confirmation is afforded by the distinct appearance of a groove, whose broken edges testify the loss of the little piece with which the alisphenoid canal should be enclosed ; so in the only fragment we possess every character that remains agrees, to help us through the difficulty in which the ambiguous dentition leaves us.

May I be permitted to express the hope, that before forming a decided judgement on these matters, naturalists will carefully investigate for themselves ; recollecting, that so long as man is not infallible, the continued progress of research must with new discoveries find something to be corrected in that which has been done before ? but whatever be the judgement on these points of difference, I trust that doubts will cease as to the truth of the original idea, which nought but error hindered from being sooner developed ; and that one important step may thus be gained towards that correct appreciation of the comparative value of groups, which we must attain throughout organic nature, before further generalizations can safely be attempted.

I will conclude by giving a list of genera arranged as I should now propose ; the characters of the groups, although many remain to be discovered, are already too numerous to be again repeated, and I only include such genera of which I have been able to examine skulls ; or in the case of fossils, of which actual specimens, casts, or well-authenticated figures of some characteristic portion of the skeleton have come within my observation.

ARTIODACTYLA.

RUMINANTIA.

Merycopotamus.
Chalicotherium*.

Bovidæ.

Sivatherium.

—

Bos.

Ovis.

Capra.

Antilope, and several of
the genera into which
these have been dis-
membered.

NON-RUMINANTIA.

Hippopotamidæ.

Hippopotamina.

Hippopotamus.

Hyopotamus.

Anthracotheium.

Chæropotamus.

Adapis.

Dicotylina.

Dicotyles.

* Of these two genera I have not yet sufficient evidence to determine the family.

RUMINANTIA.

*Cervidæ.**Cervina.*Cervus, and various sub-
genera.*Camelopardalina.*

Camelopardalis.

*Moschidæ.**Moschina.*

Moschus.

Meminna.

Hyeomoschus.

Dorcatherium.

Dichobunina.

Cainotherium.

Dichodon.

Dichobune.

Xiphodon.

*Camelidæ.**Anoplotheriana.*

Anoplotherium.

Camelina.

Llama.

Camelus.

NON-RUMINANTIA.

Suidæ.

Sus.

Hippohyus.

Babirussa.

Phascochærus.

PERISSODACTYLA.

TYPICA.

*Rhinocerotidæ.**Equina.*

Equus.

Rhinocerotina.

Macrauchenia.

Nesodon.

Rhinoceros.

Acerotherium.

Elasmotherium.

Hyrax.

Palæotherium.

Paloplotherium.

Tapirus.

Lophiodon.

Coryphodon.

Hyracotherium.

ABERRANTIA.

Elephantidæ.

Deinotherium.

Mastodon.

Elephas.

Toxodontidæ.

Toxodon.

Manatidæ.

Halicore.

Manatus.